

REMARKS

Examiner J. L. Brophy is thanked for the thorough examination and search of the subject Patent Application. Claims 1, 12, 24, and 28 have been amended.

All Claims are believed to be in condition for Allowance, and that is so requested.

Reconsideration of the rejection under 35 U.S.C. 102 of Claims 1, 3 and 6 as being anticipated by JP08102489A is requested in view of amended Claim 1 and in accordance with the following remarks.

Applicants' invention provides a means for improving adhesion of a TEOS oxide layer to an underlying low dielectric constant material layer. Silicon ions are implanted into the underlying layer to improve adhesion. As shown in Fig. 2, the silicon implantation is performed on a flat surface. The underlying passivation layer 12, claimed in Claim 1, is also a planarizing layer. In JP08102489A, the silicon implantation is performed over non-planar features (See Fig. 1a). JP08102489A teaches implanting silicon ions into a plasma TEOS film to prevent moisture diffusion. Those skilled in the art of microelectronics know that the definition of low dielectric constant means a dielectric constant of less than 3, as shown in exhibits presented with the previous responses. The Examiner has provided evidence of a dielectric constant of greater than 3 for non-porous FSG. Dielectric constants of porous FSG may be lower than 3. However, as evidence of this has not yet been found, Claim 1 has been amended to omit "porous and non-porous-doped silicon oxides" in the list of preferred materials. The claim has also been amended

to read “selected from the group consisting of” the preferred materials. The plasma TEOS film of JP08102489A is not one of Applicants’ preferred materials. It is believed that the amendment to Claim 1 overcomes the 102 rejection over JP08102489A . The preferred materials of Claim 1 are not taught by the reference.

Reconsideration of the rejection under 35 U.S.C. 102 of Claims 1, 3 and 6 as being anticipated by JP08102489A is requested in view of amended Claim 1 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 102 of Claim 1 as being anticipated by Muroyama is requested in view of amended Claim 1 and in accordance with the following remarks.

Muroyama teaches implanting silicon ions into a thermal oxide film to make its surface hydrophobic. The dielectric constant of undoped silicon dioxide is 4 to 4.2. (as shown in Exhibit F presented with the previous amendment). Thus, the material of Muroyama is not a low dielectric constant material and is therefore different from Applicants' claimed invention. Claim 1 has been amended to claim a restrictive group of low dielectric constant materials. Muroyama’s undoped silicon oxide is included in the group. The PSG taught by Muroyama is also not included in the amended Claim 1. The materials claimed in amended Claim 1 are not taught by Muroyama.

Reconsideration of the rejection under 35 U.S.C. 102 of Claim 1 as being anticipated by Muroyama is requested in view of amended Claim 1 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 102 of Claim 1 as being anticipated by Watanabe et al is requested in view of amended Claim 1 and in accordance with the following remarks.

Watanabe et al teaches implanting silicon ions into a spin-on-glass film to decompose its organic components. As discussed in response to the previous office action, organic spin-on-glass appears to fall into the category of low dielectric constant materials of carbon-doped silicon oxide. The lengthy discussion, not repeated here, shows that Watanabe's siloxane SOG has a high dielectric constant of greater than 3 and is not the same as the low-k materials recited in Applicants' claim.

Reconsideration of the rejection under 35 U.S.C. 102 of Claim 1 as being anticipated by Watanabe et al is requested in view of amended Claim 1 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 103 of Claims 4, 5, and 24-27 as being unpatentable over JP08102489A or Watanabe et al is requested in view of Amended Claims 1 and 24 and in accordance with the following remarks.

JP08102489A teaches implanting silicon ions into a plasma TEOS film to prevent moisture diffusion. Watanabe et al teaches implanting silicon ions into a spin-on-glass film to decompose its organic components. As discussed above, the low dielectric constant (<3) materials claimed in amended Claims 1 and 24 are not taught or suggested in the references. Furthermore, Claim 24 has been amended to claim the roughened surface of the low-k layer resulting from the silicon ion implantation and providing improved adhesion of the overlying layer.

Reconsideration of the rejection under 35 U.S.C. 103 of Claims 4, 5, and 24-27 as being unpatentable over JP08102489A or Watanabe et al is requested in view of Amended Claims 1 and 24 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 103 of Claims 3-6, and 24-27 as being unpatentable over Muroyama is requested in view of Amended Claims 1 and 24 and in accordance with the following remarks.

Muroyama teaches implanting silicon ions into a thermal oxide film to make its surface hydrophobic. The thermal oxide film and the optional PSG film taught by Muroyama are not included in the list of preferred materials in Claims 1 and 24. The materials claimed in Claims 1 and 24 are not taught or suggested in Muroyama.

Reconsideration of the rejection under 35 U.S.C. 103 of Claims 3-6, and 24-27 as being unpatentable over Muroyama is requested in view of Amended Claims 1 and 24 and in accordance with the remarks above.

Reconsideration of the rejection under 35 U.S.C. 103 of Claims 12, 14-17, 23, and 28-32 as being unpatentable over Watanabe et al is requested in view of Amended Claims 12 and 28 and in accordance with the following remarks.


Watanabe et al teaches implanting silicon ions into a spin-on-glass film to decompose its organic components. As discussed above, low dielectric constant (<3) materials claimed in Applicants' invention are not taught or suggested in the references. It is agreed that forming a copper layer within an opening is taught in Watanabe et al, but this is not a damascene process.

Reconsideration of the rejection under 35 U.S.C. 103 of Claims 12, 14-17, 23, and 28-32 as being unpatentable over Watanabe et al is requested in view of Amended Claims 12 and 28 and in accordance with the remarks above.

Allowance of all Claims is requested.

It is requested that should Examiner Brophy not find that the Claims are now Allowable that the Examiner call the undersigned at 765 4530866 to overcome any problems preventing allowance.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Rosemary L. S. Pike".

Rosemary L. S. Pike. Reg # 39,332